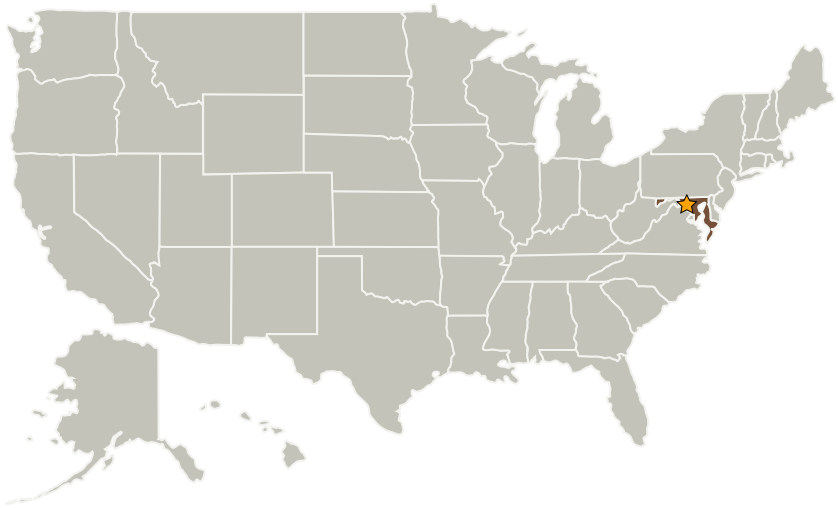
High Speed Magnetostrictive MEMS Actuated Mirror Deflectors, Phase II

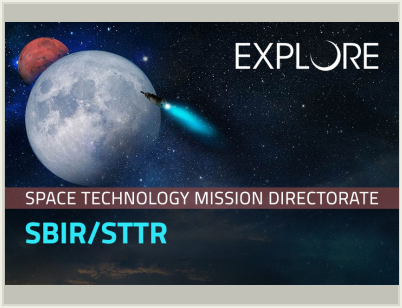
Completed Technology Project (2005 - 2007)

Project Introduction

The main goal of this proposal is to develop high speed magnetostrictive and MEMS actuators for rapidly deflecting or deforming mirrors. High speed, light-weight, beam deflectors are required for many NASA applications including rapid laser tuning, airborne lidar transmitters and receivers, image correctors, scanners, target acquisition and countermeasures. Current electro-mechanical, electro and acousto-optical technologies suffer from many problems: low speed, high voltage requirement, limited life, hysteresis, high cost and bulky connections. Magentostrictive materials have the potential for achieving large displacements (>100?m) at high frequencies (~ 40kHz) with compact and rugged devices. In Phase I we have built several magnetostrictive devices and demonstrated feasibility of compact high speed actuators. Rod actuators built from composite materials showed effective high frequency operation to 10kHz. Thin magnetostrictive films deposited on silicon wafer cantilever substrates have demonstrated good high frequency operation up to 20kHz. Further optimization of the magnetic field generators and thin films will allow 40kHz operation. Also an innovative high speed laser wavelength tuner technique was developed using a surrogate deflector. In Phase II we will build prototype high speed mirror systems using magnetostrictive composite rod and thin film cantilever beam actuators. They will be incorporated into tunable laser and lidar receiver systems and tested.

Primary U.S. Work Locations and Key Partners





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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Goddard Space Flight Center (GSFC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
★Goddard Space Flight Center(GSFC)	Lead Organization	NASA Center	Greenbelt, Maryland
Science and Engineering Services, Inc	Supporting Organization	Industry Small Disadvantaged Business (SDB)	Burtonsville, Maryland

Primary U.S. Work Locations
Maryland

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Technology Areas

Primary:

- TX08 Sensors and Instruments
  - TX08.1 Remote Sensing Instruments/Sensors
    - TX08.1.1 Detectors and Focal Planes